RT412

Optical Transceiver

User Manual

(Rev 1.1)

Contents

Preface

Products developed by Reason are continuously improved. The information this document contains reflects this improvement, and for this reason it is subject to change without notice. Please make sure that this is latest version of this document before proceeding. All specifications are subject to changes without prior notice.

Certification to the ISO 9001:2008 quality standard is an example of this commitment. We encourage and appreciate any feedback and will use it to improve our products and services.

About the Document

This manual is intended to technically qualified personnel who has been trained or is knowledgeable in instrumentation and engineering fields.

This user manual is part of the scope of delivery and provides basic information for installation, configuration, operation and maintenance of the equipment here described. In case additional information is needed, please contact Reason at the addresses provided at the beginning of this document.

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Acronyms and Abbreviations

AC - Alternating Current;

BNC - Bayonet Neil Concelman onnector;

CF - Federal Constitution;

DC - Direct Current;

GND - Ground;

GPS - Global Positioning System;

IEC - International Electrotechnical Commission;

IED - Intelligent Electronic Devices;

IEEE - Institute of Electric and Electronic Engineers;

IHM - Human-Machine Interface;

IP40 - Degree of Protection 40 code;

IRIG-B - Time synchronism protocol (Inter Range Instrumentation Group - Rate Designation B);

OUT - Output;

PPM - Pulse-per-minute;

PPS - Pulse-per-second;

PPX - Pulse-per-X s;

RT - Time recorder (Time synchronism equipment of Reason);

ST - Bayonet-lock connector;

TTL - Transitor-to-transitor logic.

1 Description

1.1 Introduction

RT412 - Optical Transceiver is an electrical-optical and optical-electrical converter. It converts signals into pulsed signals for time synchronism. Also, the features allow multiplying the outputs of GPS clocks.

The equipment has optical or electrical input, selectable by the user. Also, it has two TTL-level electrical outputs and an optical output. It accepts IRIG-B signals or any other frequency signal (1PPS, 100PPS, 1PPM, inter alia).

The power supply is full range integrated.

The delay of the output signal in relation to the input is under 100 ns.

This User Manual is structured as follows:

Chapter 1 presents RT412 descriptions, its applications, technical specifications, and how the manual is presented.

Chapter 2 presents how RT412 should be installed, considering power supply, cables connections, synchronism outputs,inter alia.

Chapter 3 describes concepts and procedures for maintenance of RT412.

APPENDIX A presents IRIG-B format of signals.

APPENDIX B presents an example of application using equipment for time synchronism.

1.2 Key Features

- 100 ns accuracy;
- Integrated optical-electrical and electrical-optical converter;
- ST connector optical Input;
- Time signals in IRIG-B00x format;
- Pulses: 100 pulses-per-second, 1 pulse-per-second, 1 pulse-per-minute and low frequency pulses;
- 2 electrical outputs with screw connector with an individual supply capacity up to 100 mA;
- 1 optical output with ST connector and multimode fiber.
- Indicators for monitoring the input signal of time synchronism and the presence of primary supply;
- DIN rail mounting;
- AC or DC power supply sources.

1.3 Front and Side View

The front panel of the RT412 presents its identification, model, and a label with Serial Number and Part Number. Figure 1 shows the front view of the equipment.

Figure 1: RT412 front view

Figure 2 shows the components of the side panel.

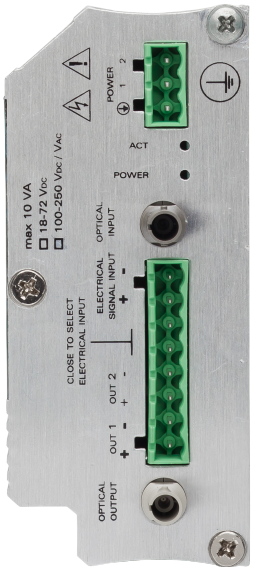

Figure 2: RT412 side view

The side panel of the RT412 comprises one feeding input, AC or DC; two electrical outputs with TTL-level screw connector; an electrical input; a jumper to select the input type; an optical input and output; synchronism signal and power supply indicators.

For information on installing the unit, see Chapter 2.

1.4 Specifications

1.4.1 Power Supply

Table 1.1: Power Supply Specifications	
Operating voltage range	80–275 V d.c., 88–264 V a.c.
Frequency	50/60 Hz $\pm$3 Hz
Consumption	$<$ 3 VA

1.4.2 Electrical Input

Table 1.2: Electrical Input Specifications	
Connectors (2)	Screw
High Level	4.2 V
Low Level	9.8 V
Impedance	$>$ 500 Ω

1.4.3 Optical Input

Table 1.3: Optical Input Specifications	
Wave Length	820 nm
Fiber Type	multimode 50/125 μm, 62.5/125 μm 100/140 μm or 200 μm HCS
Connector	ST
Sensibility	$-$24 dBm

1.4.4 Electrical Outputs

Table 1.4: Electrical Outputs Specifications	
Conectors (4)	Screw (2 outputs)
High Level [1]	$>$ 4 V d.c.
Low Level [2]	$<$ 0.2 V d.c.
Impedance	$>$ 500 Ω
Current	100 mA (for 2 outputs)

[1] Level above which the equipment recognizes output as activated;
[2] Level below which the equipment recognizes output as disabled.

1.4.5 Optical Outputs

Table 1.5: Optical Outputs Specifications	
Wave Length	820 nm
Fiber Type	50/125 μm, 62.5/125 μm, 100/140 μm or 200 μm HCS multimode
Connector	ST
Transmission Power	-17.8 dBm (50/125 μm) -14.0 dBm (62.5/125 μm) -8.5 dBm (100/140 μm) -5.7 dBm (200 μm HCS)

1.4.6 Environment

Table 1.6 Environment Specifications	
Operating temperature	$+5 \ldots +55$ °C
Enclosure protection	IP40
Relative humidity	5 . . . 95% (noncondensing)
Maximum Altitude	2000 m (6560 ft)

1.4.7 Weight and Dimensions

Table 1.7: Weight and Dimensions Specifications	
Height	117 mm
Width	51 mm
Depth	95 mm
Weight	1 Kg

RT412 dimensions are shown in Figure 3.

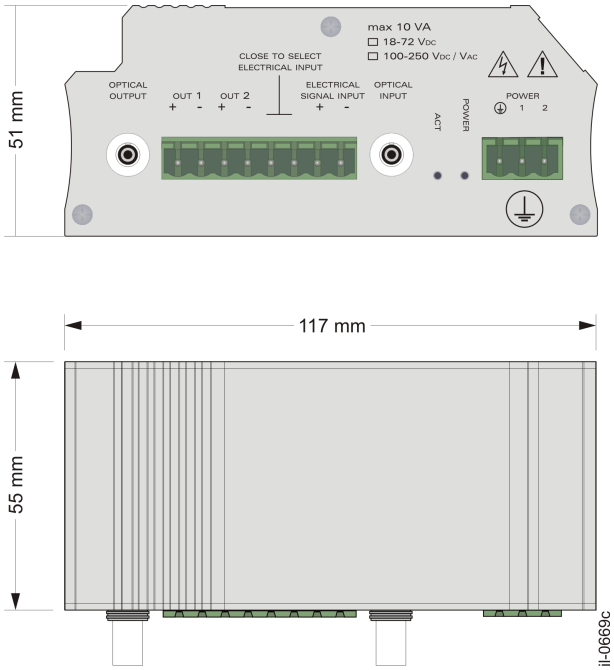

Figure 3: RT412 Dimensions

2 Installation

2.1 Unpacking

Unpack the unit carefully and make sure all the accessories and cables are put aside so they will not be lost.

Check the contents against the packing list that goes with the product. If any of the content listed is missing, please contact Reason (see contact information at the beginning of this manual).

Examine the unit for any shipping damage. If the unit is damaged or fails to operate, notify the shipping company without delay. Only the consignee (the person or company receiving the unity) can file a claim against the carrier for shipping damage.

We recommend you keep the original packing materials for eventual future transport.

2.2 External Indications

The serial number and part number are shown on a label fixed on the side of the unit, as shown in Figure 4.

Figure 4: Location of Serial number and Part Number

2.3 Environment

Temperature and relative humidity should not exceed the limits stated in Chapter 1. We recommend providing appropriate heating or cooling measures to ensure that these limits are respected at all times.

2.4 Mounting

RT412 has been designed to be mounted on DIN rails. A support bracket, shown in Figure 5, must be used.

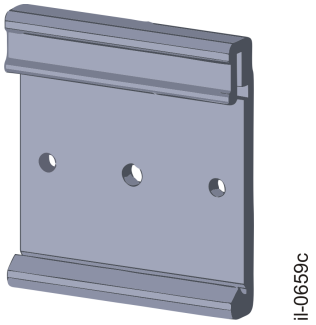

Figure 5: Support bracket to assemble the unit on DIN rails

For more information about dimensions of the unit, see Chapter 1.

2.5 Connectors

All RT412 components and connectors are shown in Figure 6.

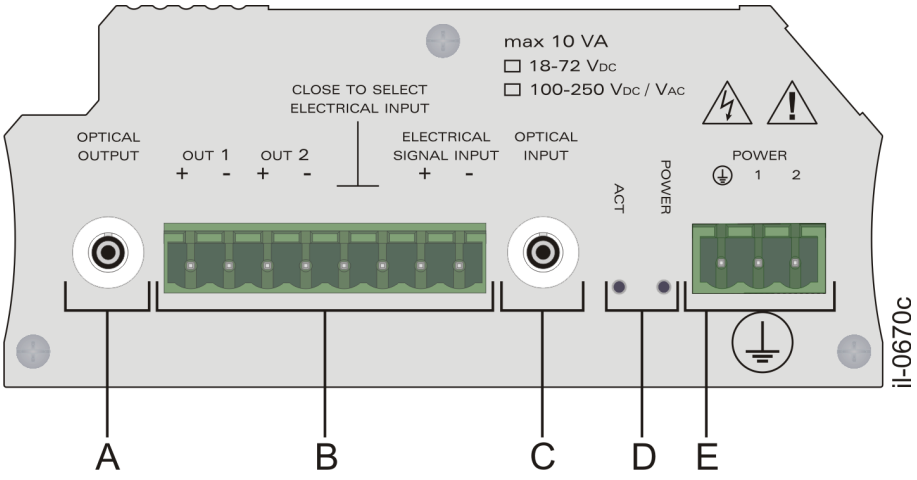

Figure 6: RT412 connectors

A Optical output;

B 2 screw connector electrical outputs for synchronism; a jumper to select the type of input; an electrical input for synchronism;

C Optical input;

D RT412 indicators:

- The ACT indicator will light upas soon as signal of one of the synchronism inputs is detected.
- The POWER indicator will light up if a primary power supply is connected to the unit.

E AC or DC input.

2.6 Power Supply

The unit can be powered from DC or AC power within the limits specified in Chapter 1.

All power connections should use insulated flameproof flexible cable (BWF type) with a 1.5 mm^2 cross section, 70°C thermal class, and 750 V insulation voltage.

To reduce the risk of electrical shock, pre-insulated tubular pin terminals should be used in the ends of power connections.

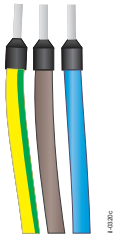

Figure 7: Pre-insulated tubular pin terminals

The pin terminals should be completely inserted into the connectors supplied with the unit, so that no metallic parts are exposed. Refer to the figure below to insert it correctly:

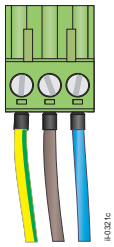

Figure 8: Supply connector assembly

A 1.5 mm^2 ground lead shall be connected to the terminal marked with the protective earth symbol for safety.

For optimal electromagnetic compatibility, ground the unit by using a 10 mm wide grounding strap to connect the frame of the unit to a good ground point on the mounting rack.

2.6.1 AC Power Connection

Phase should be applied to terminal 1 and neutral to terminal 2 in each of the supply terminals identified as POWER, as shown in Figure 9.

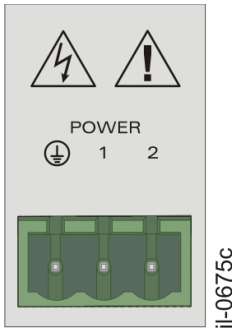

Figure 9: AC power connection

The installation of an external 10 A, category C, unipolar circuit breaker near the unit is recommended. The circuit breaker should have an interruption capacity of at least 25 kA and comply with IEC 60947-2 standard.

2.6.2 DC Power connection

Positive should be applied to terminal 1 and negative to terminal 2 in each of the supply terminals identified as POWER, as shown in Figure 10.

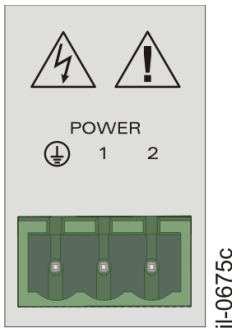

Figure 10: DC power connection

The installation of an external 10 A, category C, unipolar circuit breaker near the unit is recommended. The circuit breaker should have an interruption capacity of at least 25 kA and comply with IEC 60947-2 standard.

2.7 Powering Up

1. Before energizing the unit, be familiarized with all the DANGER and ATTENTION indicators in the eq.
2. Connect the power supply (including the ground lead) to the appropriate terminals. After connecting the power supply, the POWER indicator will light up.
3. To turn off the unit, disconnect the power supply (including the ground lead) from the terminals. All front panel indicators will turn off.

In case the unit does not behave in a way here described, carefully check all power and signal connections. See Chapter 3 for additional suggestion for problem diagnosis.

2.8 Electrical Input

RT412 has an electrical input with screw connector, to be used as electrical-optical converter, identified as ELECTRICAL SIGNAL INPUT, as shown in Figure 11.

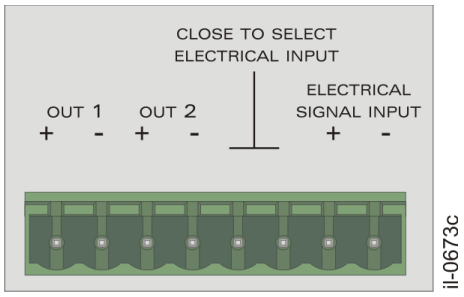

Figure 11: TTL level electrical input

The input accepts demodulated IRIG signals, 1PPS, 1PPM, 100PPS, or low frequency pulses. The signal inserted in the selected input is sent to the electrical and optical outputs.

To use the electrical input, the jumper must be connected according to the Section 2.10.

2.9 Optical Output

RT412 has an optical input with BNC connector, to be used as optical-electrical converter, identified as OPTICAL INPUT, as shown in Figure 12.

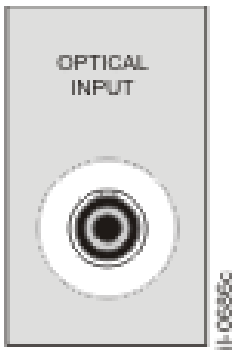

Figure 12: Optical Input

The input accepts demodulated IRIG signals, 1PPS, 1PPM, 100PPS, or low frequency pulses. The signal inserted in the selected input is sent to the electrical and optical outputs.

To use the optical input, the jumper should remain open, according to the Section 2.10.

2.10 Jumper to Select Input

RT412 can be used with an optical or electrical input. To select the type of input desired, the following logic must be used:

Table 2.1: Jumper to select the input	
Closed Jumper	Electrical Input
Open Jumper	Optical Input

The jumper to select the input is identified as CLOSE TO SELECT ELECTRICAL INPUT, as show in Figure 13.

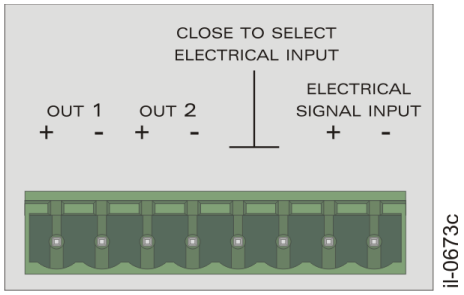

Figure 13: Jumper to select the input

2.11 Electrical Outputs

RT412 has 2 screw connector electrical outputs, identified as OUT 1 and OUT 2, according to Figure 14.

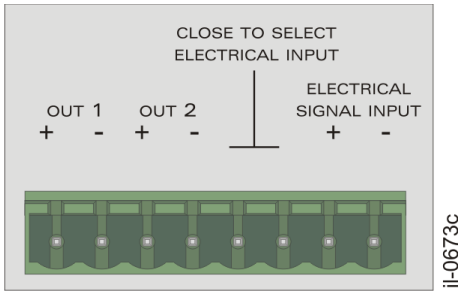

Figure 14: TTL Level electrical outputs

The synchronism signal inserted in the selected input is sent to the electrical and optical outputs.

2.12 Optical Output

RT412 has 1 BNC connector optical output, identified as OPTICAL OUTPUT, according to Figure 15.

Figure 15: Optical output

The synchronism signal inserted in the selected input is sent to the electrical and optical outputs.

2.13 Status Indicators

RT412 has status indicators for monitoring the presence of primary supply and data flow between the synchronism input and output, according to Figure 16.

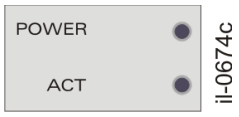

Figure 16: RT412 Status Indicators

The POWER indicator will light up as soon a primary power supply is connected to the unit. In case the power supply is interrupted, the indicator will turn off.

The ACT indicator, when lit, indicates data flow between the input and output.

3 Maintenance

3.1 Synchronism Failure

When the unit is operating without data flow between the input and output, the ACT indicator will remain off. Every time synchronism failure is detected, the following actions are recommended:

- Make sure the unit is turned on.
- Make sure the electrical or optical-fiber cables are connected properly.
- Make sure the receipt and transmission connectors are not changed.
- Make sure the input configuration (Jumper) is correct.
- Make sure the electrical or optical-fiber cables are in good conditions.
- If possible, do the test using another electrical or optical-fiber cable.
- Make sure the optical-fiber cable is according to the specifications established.

3.2 Power Supply Failure

If there is no power supply, the POWER indicator will remain off. When there is voltage failure, the following actions are recommended:

- Make sure the terminals 1, 2 and Ground are connected properly.
- Make sure there is voltage in the power supply terminal.

3.3 Cleaning Instructions

Before cleaning the equipment, make sure that the primary voltage is removed. If it is necessary cleaning the exterior of the equipment, use only a dry cloth. Internally it is not required any cleaning.

3.4 Returning a Unit

In case repair service is needed, contact Reason to check out the shipment options and receive a technical assistance reference code. To contact Reason, see the Contact section of this manual.

The unit shall be packed in its original package or a suitable package to protect against impacts and moisture.

Identify the package with the technical assistance code and send it to the address supplied.

APPENDIX A - IRIG-B Standard Summary

IRIG-B004 and IRIG-B124 content:

Table A.1: IRIG-B standard summary			
0	P_r	reference bit (P_r)	
1	P_r + 10 ms	seconds 1	seconds (0 . . . 59 or 60)
2	P_r + 20 ms	seconds 2	
3	P_r + 30 ms	seconds 4	
4	P_r + 40 ms	seconds 8	
5	P_r + 50 ms	index bit (0)	
6	P_r + 60 ms	seconds 10	
7	P_r + 70 ms	seconds 20	
8	P_r + 80 ms	seconds 40	
9	P_r + 90 ms	position identifier 1 (P_1)	
10	P_r + 100 ms	minutes 1	minutes (0 . . . 59)
11	P_r + 110 ms	minutes 2	
12	P_r + 120 ms	minutes 4	
13	P_r + 130 ms	minutes 8	
14	P_r + 140 ms	index bit (0)	
15	P_r + 150 ms	minutes 10	
16	P_r + 160 ms	minutes 20	
17	P_r + 170 ms	minutes 40	
18	P_r + 180 ms	index bit (0)	
19	P_r + 190 ms	position identifier 2 (P_2)	
20	P_r + 200 ms	hours 1	hours (0 . . . 23)
21	P_r + 210 ms	hours 2	
22	P_r + 220 ms	hours 4	
23	P_r + 230 ms	hours 8	
24	P_r + 240 ms	index bit (0)	
25	P_r + 250 ms	hours 10	
26	P_r + 260 ms	hours 20	
27	P_r + 270 ms	index bit (0)	
28	P_r + 280 ms	index bit (0)	
29	P_r + 290 ms	position identifier 3 (P_3)	
30	P_r + 300 ms	days 1	day of the year (1 . . . 365 or 366)
31	P_r + 310 ms	days 2	
32	P_r + 320 ms	days 4	
33	P_r + 330 ms	days 8	
34	P_r + 340 ms	index bit (0)	
35	P_r + 350 ms	days 10	
36	P_r + 360 ms	days 20	
37	P_r + 370 ms	days 40	
38	P_r + 380 ms	days 80	
39	P_r + 390 ms	position identifier 4 (P_4)	

40	P_r + 400 ms	days 100	
41	P_r + 410 ms	days 200	
42	P_r + 420 ms	index bit (0)	
43	P_r + 430 ms	index bit (0)	
44	P_r + 440 ms	index bit (0)	
45	P_r + 450 ms	index bit (0)	
46	P_r + 460 ms	index bit (0)	
47	P_r + 470 ms	index bit (0)	
48	P_r + 480 ms	index bit (0)	
49	P_r + 490 ms	position identifier 5 (P_5)	
50	P_r + 500 ms	year 1	two digits of the year (00 . . . 99)
51	P_r + 510 ms	year 2	
52	P_r + 520 ms	year 4	
53	P_r + 530 ms	year 8	
54	P_r + 540 ms	index bit (0)	
55	P_r + 550 ms	year 10	
56	P_r + 560 ms	year 20	
57	P_r + 570 ms	year 40	
58	P_r + 580 ms	year 80	
59	P_r + 590 ms	position identifier 6 (P_6)	
60	P_r + 600 ms	index bit (0)	
61	P_r + 610 ms	index bit (0)	
62	P_r + 620 ms	Daylight Saving Pending (DSP)	1 during the minute that precede the beginning or the end of DST
63	P_r + 630 ms	Daylight Saving Time (DST)	1 during the DST
64	P_r + 640 ms	Time Offset Sign (0=+, 1=-)	between the local time and UTC (negative for West of Greenwich)
65	P_r + 650 ms	Time Offset 1	between the local time and UTC (-12 . . . +12)
66	P_r + 660 ms	Time Offset 2	
67	P_r + 670 ms	Time Offset 4	
68	P_r + 680 ms	Time Offset 8	
69	P_r + 690 ms	position identifier 7 (P_7)	
70	P_r + 700 ms	Time Offset /2	
71	P_r + 710 ms	Time Quality	0000 (0) : locked
72	P_r + 720 ms	Time Quality	1111 (F) : no-time
73	P_r + 730 ms	Time Quality	1011 (B) : never locked
74	P_r + 740 ms	Time Quality	0100 (4) : free-wheeling
75	P_r + 750 ms	Parity (odd)	Module 2 of the data bits sum, from 0 to 74 (Bits 75-99 are not included in the sum)
76	P_r + 760 ms	index bit (0)	
77	P_r + 770 ms	index bit (0)	

78	P_r + 780 ms	index bit (0)	
79	P_r + 790 ms	position identifier 8 (P_8)	
80	P_r + 800 ms	time-of-day 1	seconds of the year
81	P_r + 810 ms	time-of-day 2	(0 . . . 86399 or 86400)
82	P_r + 820 ms	time-of-day 4	
83	P_r + 830 ms	time-of-day 8	
84	P_r + 840 ms	time-of-day 16	
85	P_r + 850 ms	time-of-day 32	
86	P_r + 860 ms	time-of-day 64	
87	P_r + 870 ms	time-of-day 128	
88	P_r + 880 ms	time-of-day 256	
89	P_r + 890 ms	position identifier 9 (P_9)	
90	P_r + 900 ms	time-of-day 512	
91	P_r + 910 ms	time-of-day 1024	
92	P_r + 920 ms	time-of-day 2048	
93	P_r + 930 ms	time-of-day 4096	
94	P_r + 940 ms	time-of-day 8192	
95	P_r + 950 ms	time-of-day 16384	
96	P_r + 960 ms	time-of-day 32768	
97	P_r + 970 ms	time-of-day 65536	
98	P_r + 980 ms	index bit (0)	
99	P_r + 990 ms	position identifier 0 (P_0)	

APPENDIX B - Application Example

Application example - Synchronism Outputs

In the Application example, shown in Figure 17, uses the three IRIG-B synchronism outputs via Ethernet network using NTP and PTP protocol and serial datagrams to synchronize relays and a disturbance recorder. It is also used an optical-electrical transceiver (RT412 - Optical transceiver) to transform an electrical output into optical when synchronizing a relay and a signal distributor (RT411 - Time Signal Distributor), that from a RT431 output, synchronizes 3 relays.

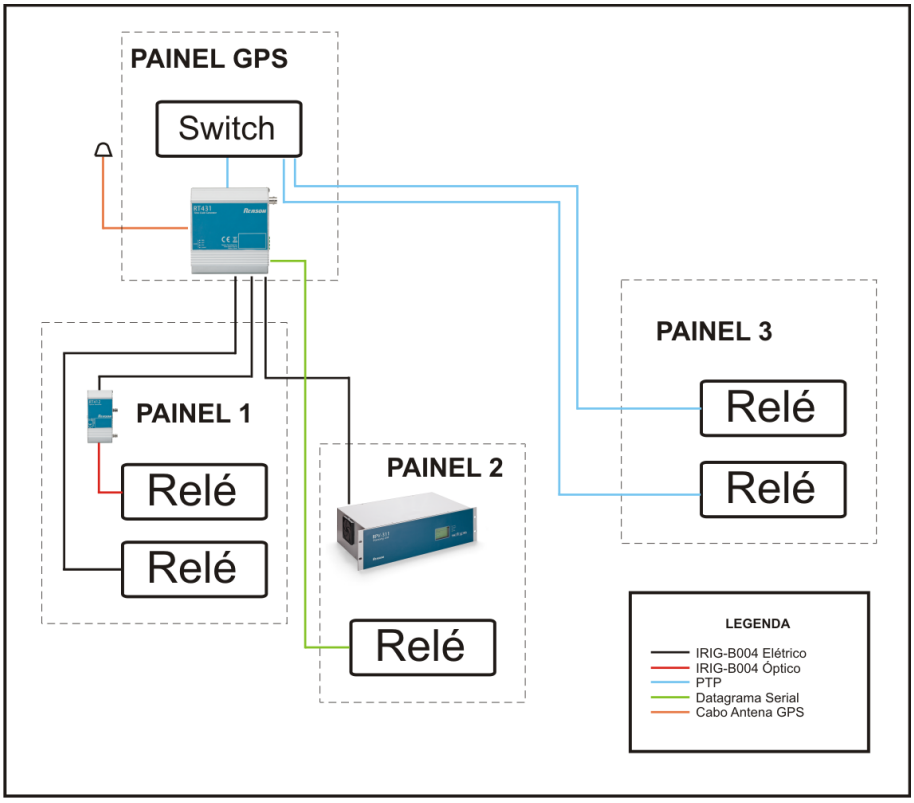

Figure 17: Application example - Synchronism Outputs